

1 WHAT IS CLAIMED IS:

1 1. In an optical fiber communications system including a transmitter node coupled to a
2 receiver node by an optical fiber, a method for synchronizing the receiver node with the
3 transmitter node, the method comprising:

4 at the transmitter node:

5 generating a reference signal;

6 synchronizing the transmitter node with the reference signal;

7 modulating the reference signal onto an optical signal; and

8 transmitting the optical signal across the optical fiber to the receiver node; and

9 at the receiver node:

10 receiving the optical signal;

11 recovering the reference signal from the optical signal; and

12 synchronizing the receiver node with the recovered reference signal.

1 2. The method of claim 1 wherein:

2 each of the transmitter node and the receiver node includes a local oscillator;

3 the step of synchronizing the transmitter node with the reference signal comprises

4 synchronizing a local oscillator at the transmitter node with the reference signal;

5 and

6 the step of synchronizing the receiver node with the recovered reference signal comprises

7 synchronizing a local oscillator at the receiver node with the recovered reference

8 signal.

1 3. The method of claim 1 wherein:

2 the step of modulating the reference signal onto an optical signal comprises:

3 generating a harmonic of the reference signal; and

4 modulating the harmonic onto the optical signal; and

5 the step of recovering the reference signal from the optical signal comprises:

recovering the harmonic from the optical signal; and
frequency dividing the harmonic to recover the reference signal.

4. The method of claim 1 wherein:

the step of modulating the reference signal onto an optical signal comprises:

frequency division multiplexing the reference signal with a plurality of electrical
low-speed channels to form an electrical high-speed channel; and
converting the electrical high-speed channel from electrical to optical form to
form the optical signal; and

the step of recovering the reference signal from the optical signal comprises:

converting the optical signal from optical to electrical form to recover the
electrical high-speed channel; and
frequency division demultiplexing the reference signal from the electrical high-
speed channel.

5. The method of claim 4 wherein, in the electrical high-speed channel, the reference signal
is located at a frequency lower than that of the electrical low-speed channels.

6. An optical fiber communications system for transmitting at least two low-speed channels
across the communications system, the communications system comprising:

a transmitter node including:

a local oscillator for generating a reference signal; and
an FDM multiplexer coupled to the local oscillator for combining the low-speed
channels with the reference signal into an electrical high-speed channel;
and

a receiver node coupled to the transmitter node by an optical fiber, the receiver node
including:

an FDM demultiplexer for recovering the reference signal from the electrical
high-speed channel;

12 a local oscillator; and
13 electronics coupled to the local oscillator and the FDM demultiplexer for
14 synchronizing the local oscillator with the recovered reference signal.

12 a local oscillator; and
13 electronics coupled to the local oscillator and the FDM demultiplexer for
14 synchronizing the local oscillator with the recovered reference signal.